

# NISTTech

## Purification & Separation of Carbon Nanotubes

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**Low cost, non-toxic, scalable process to generate debundled, debulked, size fractionated carbon nanotubes**

### Description

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This invention is a scalable method for purification, size-separation, and dispersion of raw carbon nanotubes (CNT). Currently, the removal of the metallic catalyst and amorphous carbon contaminants is a significant barrier to isolating a relatively pure population of carbon nanotubes. Available CNT processing methods are not easily scalable, produce significant toxic waste by-products and destroy up to 90% of the starting material.

NIST scientists have invented a low cost, non-toxic, scalable process to generate debundled, debulked, size fractionated carbon nanotubes that can accelerate the development of nanotubes for use in an array of applications ranging from electronics to biotechnology.

The process involves grit shearing using a sharp, light-weight particle that collides with the surface of the CNT material. This is a physical process that removes the brittle, less stable carbon shell "slag" and separates bundles of CNTs to individual or smaller bundles.

### Images

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Shown are CNT after grit shearing/ micron filtering left:  $>50\ \mu\text{m}$  middle:

### Applications

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- **Metrology**

Applicable to setting "nano-standards" and in the metrology of carbon nanotubes.

- **Magnetic alignment**  
Aligns the magnetic fields of carbon nanotubes.
- **Drug delivery**  
For both drug delivery and crystal growth seeding processes.
- **Toxicology**  
Aids in toxicology and safety studies of substances.
- **Lithium storage**  
Allows lithium storage at the nano-scale creating nano-batteries.

## Advantages

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- **Low cost**  
Low cost for users.
- **Clean technology**  
Closed-system method of CNT separation: recyclable, water-based, and low-energy and does not produce or use aerosols or inorganic solvents.

## Abstract

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A method of harvesting carbon nanotubes (CNTs) is provided. According to this method, CNT bundles, comprising CNTs associated with metallic catalysts and having amorphous carbon coatings are agitated in an aqueous liquid containing a dispersant with free-flowing grit particles to disassociate the CNTs from the metallic catalysts, remove the amorphous carbon of the amorphous carbon coatings and shorten the CNTs via shearing.

## Inventors

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## Related Items

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- PowerPoint Presentation: Descaling, Debluking, Debundling, Catalyst Removal & Shortening of Carbon Nanotubes

## References

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- U.S. Patent Application # 20090101505
- Docket: 07-027

## **Status of Availability**

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This invention is available for licensing.

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